

### **REMARKS**

Claims 1-3, 32, 34, 36 and 38-42 have been amended. No new matter has been added. Support for the amendments may be found throughout the specification.

New claims 43-50 have been added. No new matter has been added. Support for the new claims may be found throughout the specification, for example, at page 4, lines 24-26, page 16, lines 11-21, page 17, lines 3-7.

The specification has been amended to insert section headings and a brief description for Figure 1. Support for the description for Figure 1 may be found at, for example, page 30, lines 7-9. The specification has also been amended to correct typographical errors in the spelling of "*crispus*."

Claims 30-33 and 36-39 have been cancelled. The claim numbering has been corrected.

Claims 1-3, 9-15, 34-35, and 38-50 are pending.

### **OBJECTION TO THE DISCLOSURE**

The Examiner has objected to the disclosure and required the correction of the term "*cripus*." See Office Action at p. 2. The specification has been amended accordingly. No new matter has been added.

### **CLAIM OBJECTIONS**

The Examiner has objected to claims 3, 32 and 37 and required the correction of the term "*cripus*." See Office Action at p. 2. Claims 32 and 37 have been cancelled thus rendering this objection moot. Claim 3 has been amended to recite "*crispus*." No new matter has been added.

### **OBJECTION TO THE SPECIFICATION**

Applicants thank the Examiner for the guidelines illustrating the preferred layout and content for patent applications. The Examiner contends that the application does not contain a figure description for Figure 1. See Office Action at p. 3. The specification has been amended to insert the section headings. The specification has also been amended to include a description for Figure 1. No new matter has been added. Support for the description for Figure 1 may be found at, for example, page 30, lines 7-9 and Table 4.

### **CLAIM REJECTIONS**

#### ***Rejection under 35 U.S.C. § 112, first paragraph and second paragraph***

The Examiner has rejected claims 1-3, 9-15, and 38-42 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. See Office Action at p. 5. The Examiner has rejected claims 1-3, 9-15 and 40-42 under 35 U.S.C. § 112, second paragraph, as being indefinite. See Office Action at p. 6. Claims 2-3, 9-15, and 38-42 depend from independent claim 1.

In an effort to expedite prosecution and not in acquiescence to the rejection, claim 1 has been amended to remove the phrase "long-acting." Claims 38 and 39 have been cancelled thus rendering this rejection moot with respect to those claims. Applicants respectfully request the withdrawal of this rejection.

#### ***Rejection under 35 U.S.C. § 103(a)***

##### ***Hamade in view of Hansen and James***

The Examiner has rejected claims 1-3, 9-15, 30-36 and 38-42 under 35 U.S.C. § 103(a) as being unpatentable over EP 0866103 to Hamade et al. ("Hamade") in view of Hansen et al., J. Biol. Chem., 272(17), p. 11581-7 (1997) ("Hansen") and James et al., J. Food Biochem., 21, p. 1-52 (1997) ("James"). See Office Action at p. 6. Claims 2-3, 9-15, 34-35, and 40-42 depend from independent claim 1. Claims 30-33, 36 and 38-39 have been cancelled thus rendering this rejection moot with respect to those claims.

Applicants have discovered an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. The first substrate is an oligomer or a polymer of a second substrate. The second substrate is a substrate for an oxidative enzyme, and the first enzyme is capable of generating the second substrate from the first substrate. The second enzyme is an oxidase. The second enzyme generates an anti-fouling compound when acting on the second substrate. See claim 1.

As acknowledged by the Examiner, "Hamade *et al.* teach a method preventing fouling surfaces submerged in water by which an anti-fouling agent is produced by an enzyme action on its substrate, and anti-fouling composition comprising an enzyme and its substrate, see abstract."

See Office Action at p. 7. Hamade describes “a coating composition comprising a film-forming resin, an enzyme, and a substrate ....” See Abstract of Hamade. Hamade does not teach or suggest an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. See claim 1. Indeed, Hamade does not provide any motivation to include a second enzyme in a composition or a reasonable expectation of successfully including a second enzyme in a composition. A reference cannot be modified or combined to reject claims as *prima facie* obvious if there is no reasonable expectation of success. See MPEP 2143.02 (citing *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)).

Further, the disclosure in Hamade would actually lead the skilled person away from the present invention as Hamade teaches that a composition with only one enzyme has an anti-fouling effect. See Example 4 of Hamade. Whilst Hamade describes the problem of achieving controlled release of the compound having antimicrobial activity, Hamade suggests that this problem is solved merely by dispersing the enzyme and the substrate in a matrix. See page 6, lines 3-12 of Hamade. In particular, Hamade states “[i]n the present invention, the penetration of water into the matrix occurs gradually and sustainedly so that the compound having antimicrobial activity is produced persistently at a controlled rate, thus achieving controlled release of this compound.” See page 6, lines 10-12 of Hamade. Hamade goes on to state that the problem of controlled release can be easily solved through the use of a coating composition that “comprises a film-forming resin, an enzyme, and a substrate, said enzyme being capable of reacting with said substrate to produce a compound having antimicrobial activity.” See page 6, lines 25-30 of Hamade.

Thus, Hamade's disclosure teaches away from the present invention as it suggests that a composition comprising an enzyme, a substrate and a film-forming resin is sufficient to overcome the problem of controlled release of the antimicrobial agent. In contrast, the present invention requires the presence of a first substrate selected from oligomers and polymers of substrates for oxidative enzymes. Thus, the present invention requires that the first enzyme reacts with an oligomer or polymeric first substrate to produce a further second substrate on which a second enzyme (an oxidase enzyme) is active.

Further, the only disclosure of an enzyme being active on a polymeric species in Hamade relates to the action of a chitosan-decomposing enzyme on chitosan to produce a compound having antimicrobial activity as a direct decomposition product of chitosan. See claim 13 of Hamade. Such a system teaches away from carrying out a second reaction with a second enzyme on the product formed from the reaction of the polymeric species with a first enzyme.

Hamade further provides a large list of non-limiting enzyme-substrate combinations which can generate a large number of different microbial agents. See page 3, line 46 to page 5, line 53 of Hamade. No directions are given in Hamade that would lead a skilled person to select any specific type of enzyme combination over any of the others that are mentioned. In particular there is no suggestion or motivation to use an oxidase enzyme with a substrate that is generated by the action of a first enzyme on a first substrate. There is no suggestion or motivation in Hamade to modify the teachings of Hamade to produce an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. See claim 1.

Hansen and James do not remedy this defect either. Hansen describes the “purification and molecular cloning of hexose oxidase from *C. crispus*, and ... the cDNA sequence of the enzyme.” See p. 11581 of Hansen. Hansen does not teach or suggest an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. See claim 1.

James describes glucoamylases, “methods used to assay glucoamylase activity,” “structural analysis of glucoamylase and main amino acids involved in catalysis and starch binding” and “the use of glucoamylase in the industry.” See Abstract of James. James does not teach or suggest an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. See claim 1.

Since claims 2-3, 9-15, 34-36, and 40-42 depend from claim 1, they are patentable over the combination of Hamade, Hansen and James for at least the reasons described above. Applicants respectfully request reconsideration and withdrawal of this rejection.

***Hamade in view of Stougaard and James***

The Examiner has rejected claim 1-3, 9-15, 30-32, 34-36 and 38-42 under 35 U.S.C. § 103(a) as being unpatentable over Hamade in view of U.S. Patent No. 6,251,626 to Stougaard

("Stougaard") and James. See Office Action at p. 6-7. Claims 2-3, 9-15, 34-35, and 40-42 depend from independent claim 1. Claims 30-32, 36 and 38-39 have been cancelled thus rendering this rejection moot with respect to those claims.

As previously described, Hamade and James do not teach or suggest an anti-fouling composition that includes a surface coating material, a first enzyme, a first substrate and a second enzyme. See claim 1.

This defect is not remedied in Stougaard. Stougaard describes "[a] method of producing hexose oxidase by recombinant DNA technology, recombinant hexose oxidase and the use of such enzyme, in particular in the manufacturing of food products such as doughs and dairy products, animal feed, pharmaceuticals, cosmetics, dental care products and in the manufacturing of lactones." See Abstract. Stougaard does not teach or suggest an anti-fouling composition that includes a second enzyme. See claim 1.

Accordingly, claim 1 and claims that depend therefrom are patentable over the combination of Hamade, Stougaard and James. Applicants respectfully request reconsideration and the withdrawal of the rejection.

#### **NEW CLAIMS 49 AND 50**

New claim 49 features a method for releasing an anti-fouling compound from a surface coating that includes incorporating in a surface coating a first enzyme, a first substrate and a second enzyme. New claim 50 features a method for treating a surface of a vessel that includes applying a coating material to the surface. The coating material includes a first enzyme, a first substrate and a second enzyme. New claims 49 and 50 are patentable since the cited references Hamade, Hansen, James and Stougaard as those references do not teach or suggest a method for releasing an anti-fouling compound from a surface coating that includes incorporating in a surface coating a first enzyme, a first substrate and a second enzyme. The above-mentioned references further do not teach or suggest a method for treating a surface of a vessel that includes applying a coating material which includes a first enzyme, a first substrate and a second enzyme. Accordingly, independent claims 49 and 50 are patentable over the Hamade, Hansen, James and Stougaard references.

**CONCLUSION**

For the foregoing reasons, Applicants respectfully request reconsideration and withdrawal of the pending rejections. Applicants believe that the claims now pending are in condition for allowance.

A petition for a three month extension of time is submitted herewith.

Should any further fees be required by the present Amendment, the Commissioner is hereby authorized to charge Deposit Account **19-4293**.

Respectfully submitted,

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